

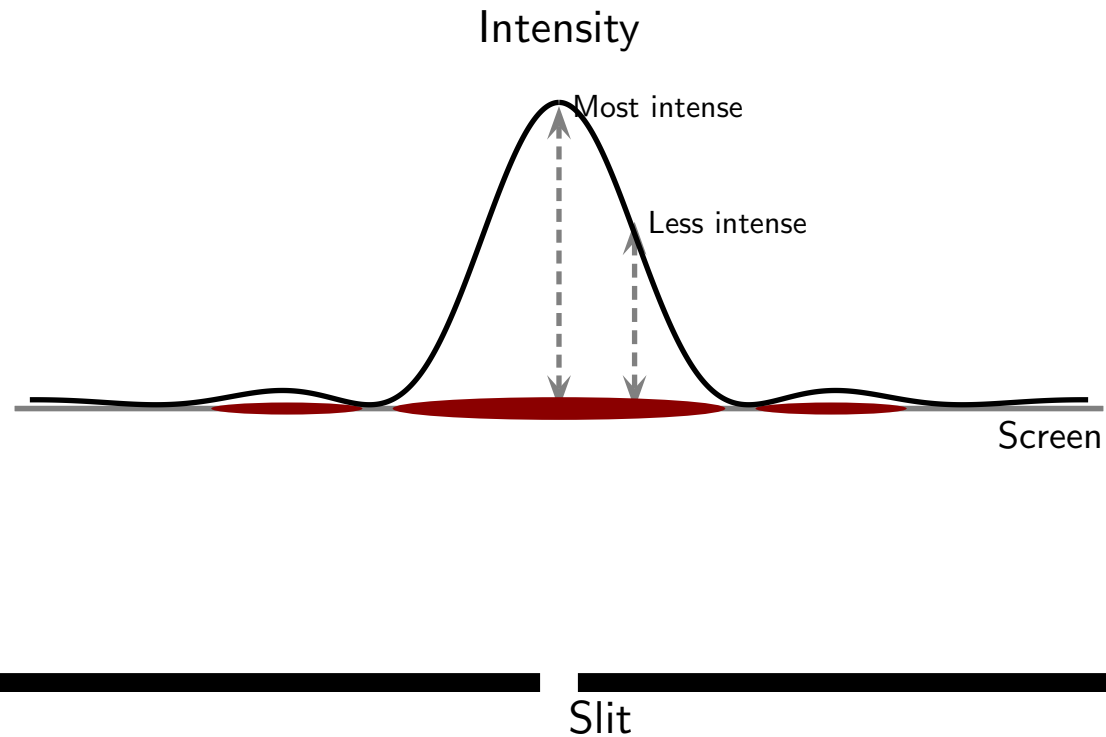
Question 1

Red light has a wavelength of about $650 \text{ nm} = 6.5 \times 10^{-7} \text{ m}$ while violet light has a wavelength of about $450 \text{ nm} = 4.5 \times 10^{-7} \text{ m}$. Both colors travel at the same speed in air.

Which of the following is true?

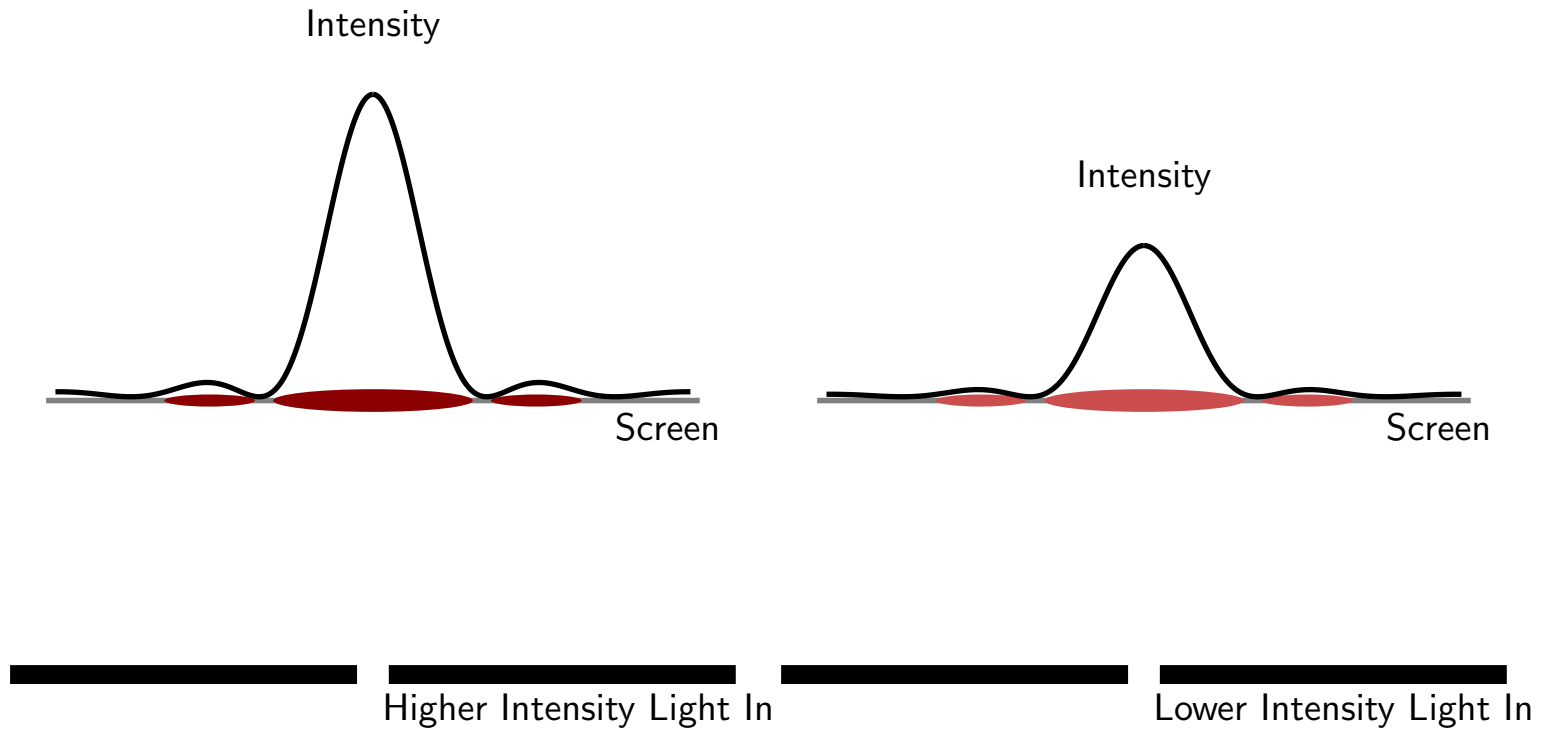
1. Red light has a higher frequency than blue light.
2. Red light has a lower frequency than blue light.
3. Red light has the same frequency as blue light.
4. The frequency depends on the brightness of the light.

Single Slit Pattern



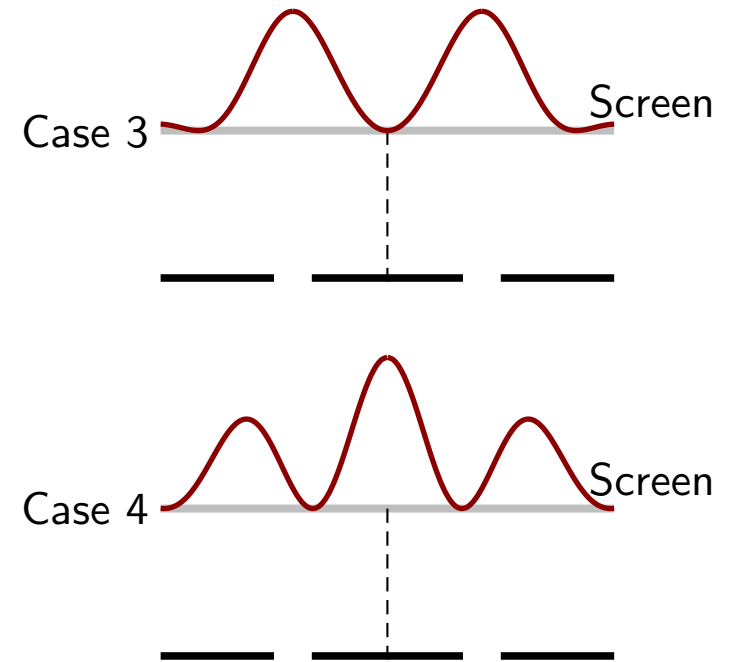
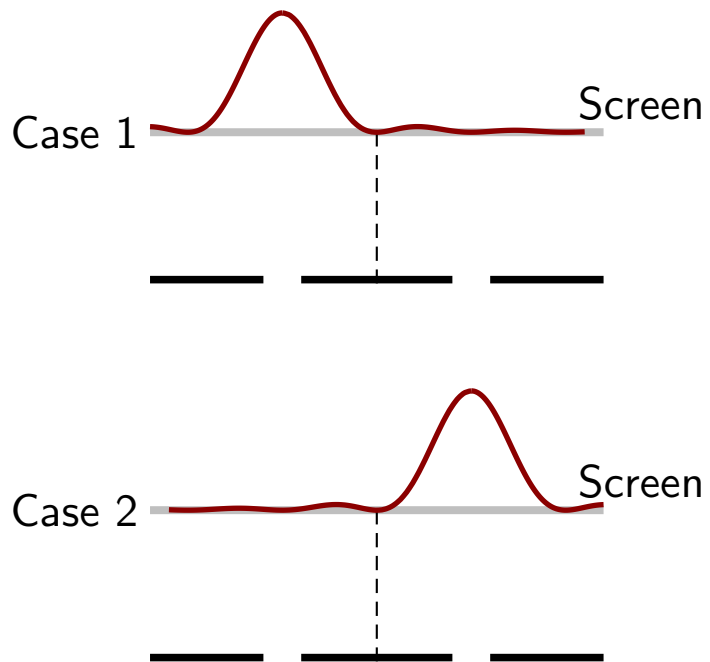
At any location on the screen, the height of the intensity curve indicates the intensity at that location.

Single Slit Pattern: Varying Intensity



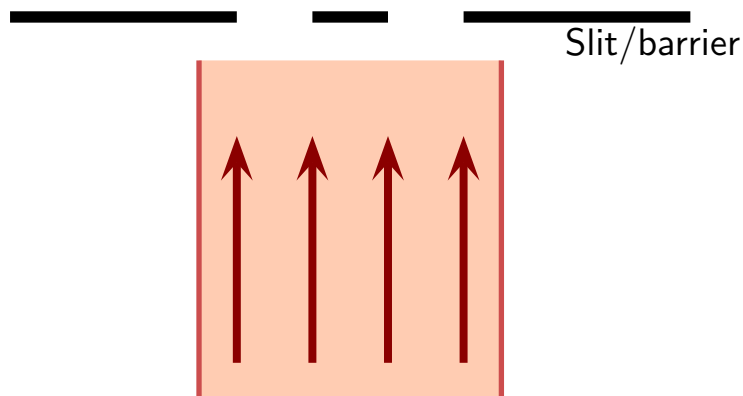
Question 2

Light with a single wavelength passes through a double slit barrier. Which of the following best represents the intensity profile of the light on a screen placed beyond the barrier?



Question 3

Very low intensity light travels toward a double slit arrangement. The beam of light is wide enough to cover both slits. One detector is placed just beyond each slit.

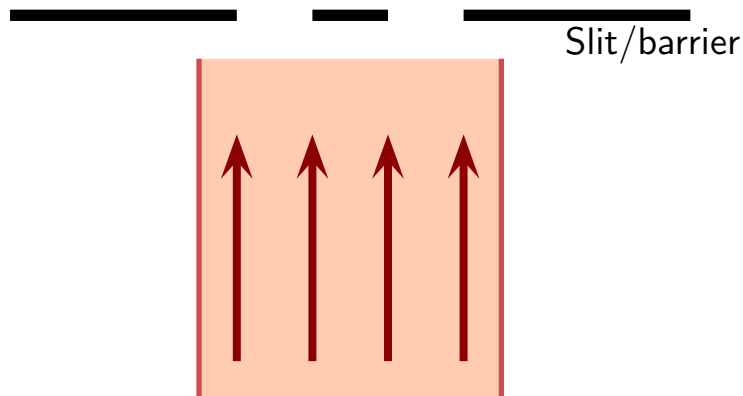


Which of the following is true of a *particular single photon* passing toward the barrier and slits?

1. This photon could arrive in *both* the left *and also* the right detector.
2. This photon could arrive in either but *just one* of the detectors.
3. This photon cannot arrive in either detector.

Question 4

Very low intensity light travels toward a double slit arrangement. The beam of light is wide enough to cover both slits. One detector is placed just beyond each slit. A pulse of light containing exactly one photon is created. Suppose that this photon is detected in the left detector.



Another identical pulse is created and this arrives at a detector. Which of the following is true?

1. The photon will definitely be detected by the right detector.
2. The photon will definitely be detected by the left detector.
3. The photon may be detected by one of the detectors but it is uncertain which.

Question 5

A pulse of light containing exactly 4000 photons is fired toward a screen that contains a small detector at one location. The number of photons that arrive at the detector is 1600.

Which of the following is true about the probability of arrival of any single photon at that detector?

1. Prob = 4000
2. Prob = 1600
3. Prob = 2.5
4. Prob = 1.0
5. Prob = 0.40
6. Prob = 0.25

Question 6

A pulse of light containing exactly 4000 photons is fired toward a screen that contains a small detector at one location. The probability of arrival of a single photon at the detector is 0.20.

Which of the following is true about the number of photons that are expected to arrive at that detector?

1. Number = 0.20
2. Number = 1
3. Number = 80
4. Number = 800
5. Number = 4000